WAC/041(30.11.98)

Ms. Regina M. Keeney
Chief of the International Bureau
Federal Communications Commission
Washington, D.C. 20554

Dear Ms. Keeney:

The National Telecommunications and Information Administration on behalf of the Executive Branch Agencies, has approved the release of the enclosed Preliminary Draft U.S. Proposal for WRC-2000. This preliminary draft contains tables that reflex the current work completed by the RCS to prepare a proposal regarding agenda item 1.16.

Agenda item 1.16 will consider allocations of frequency bands above 71 GHz to the earth-exploration satellite (passive) and radio astronomy services, taking into account Resolution **723(WRC-97)**. While the attached tables do not constitute a formal draft proposal, they do represent our proposed resolution of the allocation issues. Because our proposed changes are so extensive, we are submitting this preliminary draft for your consideration and comment prior to submitting a formal draft proposal. We have also included an appendix that looks at the *Analysis of Passive Services from 71 - 275 GHz*; this appendix provides some background information that supports our proposal.

Sincerely,

William T. Hatch
Acting Associate Administrator
Office of Spectrum Management

Enclosure

## United States of America

## PROPOSALS FOR THE WORK OF THE CONFERENCE

Proposal for Agenda Item 1.16

Preliminary Draft

to consider allocations of frequency bands above 71 GHz to the earth-exploration satellite (passive) and radio astronomy services, taking into account Resolution 723

**Background Information:**

The following tables depict the continued status of the work within RCS WG-4 toward modifications to the allocation tables above 71 GHz to accommodate the requirements of passive sensing systems in the radio astronomy and earth-exploration satellite (passive) services. This revision to RCS-00-141 addresses the complete band segment 71 – 275 GHz.

Appendix: Analysis of Passive Services 71 - 275 GHz Proposal

**Preliminary Draft Proposal for WRC-00 (Agenda Item 1.16)**

| **GHz**<br>**71 – 126** | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **71- 74**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>MOBILE-SATELLITE (Earth-To-Space)<br>S5.149 S5.556 | **71 - ~~74~~ 73**<br>BROADCASTING-SATELLITE<br>FIXED<br>FIXED SATELLITE (space-to-Earth)<br>~~FIXED-SATELLITE (Earth-to-space)~~<br>MOBILE<br>~~MOBILE-SATELLITE (Earth-To-Space)~~<br>~~S5.149 S5.556~~ MOD S5.561 | 84-86 GHz BSS and 102-105 FSS (space-to-Earth) allocations moved to this band to protect RAS from downlinks.<br>Atmospheric absorption slightly higher ( ~ 0.6 dB at zenith) in 71-73 GHz band than in 84-86 or 102-105 GHz band.<br>BS footnote S5.561, suitably modified, transferred from 84-86 GHz band.<br>RAS Footnotes S5.149 and S5.556 deleted, in favor of allocations above 76 GHz. References to 72.77-72.91 GHz band in S5.149 and S5.556 deleted. |
| **74-75.5**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>Space Research (space-to-Earth) | ~~**74 75.5**~~ **73-76**<br>~~AMATEUR~~<br>~~AMATEUR-SATELLITE~~<br>FIXED<br>~~FIXED-SATELLITE (Earth-to-space)~~<br>FIXED-SATELLITE (space-to Earth)<br>MOBILE<br>~~MOBILE-SATELLITE (Earth-to-space)~~<br>MOBILE-SATELLITE (space-to-Earth)<br>Space Research (space-to-Earth)<br>~~S 5.149 S5.556~~ | Downlinks currently allocated to the 81-84 GHz band relocated to this band, to protect RAS above 76 GHz. Paired with the 81.5-84.5 GHz band.<br>No change in footnotes.<br>Atmospheric absorption slightly higher (~0.5 dB)at zenith in 73-76 GHz band than in 84-86 GHz band<br>The proposed allocations in the 73-84.5 GHz range preserve a contiguous 11.5 GHz space research downlink (secondary), required for space VLBI. |
| **75.5-76**<br>AMATEUR<br>AMATEUR-SATELLITE<br>Space Research (space-to-Earth) | | |

| **GHz**<br>**71 –126 (continued)** | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/ Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **76-81**<br>RADIOLOCATION<br>Amateur<br>Amateur-Satellite<br>Space Research (space-to-Earth)<br>S5.560 | ~~**75.5-76**~~ **76 - 76.5**<br>AMATEUR<br>~~RADIOLOCATION~~<br>AMATEUR-SATELLITE<br>~~Amateur~~<br>~~Amateur-Satellite~~<br>Radio Astronomy<br>Space Research (space-to-Earth)<br>~~S5.560~~ | Amateur and amateur-satellite services shifted by 0.5 GHz, to accommodate BS, FSS and MSS downlinks at lower portion of atmospheric window.<br>RAS added on a secondary basis, to reflect co-ordination requirement with amateur-satellite service.<br>No change in sharing between services, except for introduction of secondary RAS allocation in band.<br>S5.560 doesn't apply to this band. |
| | **76.5 - 81.5**<br>RADIO ASTRONOMY S5.ZZZ<br>RADIOLOCATION<br>Amateur<br>Amateur-Satellite<br>Space Research (space-to-Earth)<br>S5.560 MOD S5.149 | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide.<br>No change in sharing between services, except for introduction of RAS allocation.<br>Band added to those listed under S5.149 |
| **81-84**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>MOBILE-SATELLITE (space-to-Earth)<br>Space Research (space-to-Earth) | **81.5 – 84.5**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>MOBILE<br>MOBILE-SATELLITE (Earth-to-space)<br>~~MOBILE-SATELLITE (space-to-Earth)~~<br>RADIO ASTRONOMY S5.ZZZ<br>Space Research (space-to-Earth)<br>MOD S5.149 | Direction of satellite downlinks reversed, to allow radio astronomy observations. Services currently allocated to the 71-74 GHz band relocated to this band. Paired with the 73-76 GHz band.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ, satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>No change in sharing between services, except for introduction of RAS allocation in band.<br>Atmospheric absorption slightly lower (approximately 0.6 dB at zenith) than in 71-74 GHz band.<br>Band added to footnote S5.149. |

| GHz<br>71 –126 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/ Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **84-86**<br>FIXED<br>MOBILE<br>BROADCASTING<br>BROADCASTING-SATELLITE<br>S5.561 | **84.5-86**<br>BROADCASTING<br>~~BROADCASTING-SATELLITE~~<br>FIXED<br>FIXED SATELLITE (Earth-to-space)<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>Space research (space-to-Earth)<br>~~S5.561~~ MOD S5.149 | Broadcasting-satellite allocation relocated to 71-73 GHz band.<br>Direction of satellite downlinks reversed, to allow radio astronomy observations. Proposed allocations correspond to services currently allocated to the 74-75.5 GHz band.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ, satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide.<br>Atmospheric absorption slightly lower (approximately 0.6 dB at zenith) than in 74-74.5 GHz band.<br>Band added to footnote S5.149. |
| **86-92**<br>EARTH EXPLORATION SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 | **86-92**<br>EARTH EXPLORATION SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 | **NOC**<br>This band is of crucial importance for the RAS, SR (passive) and EES (passive) services; it is the window for the band around 118.75 GHz. No active services are acceptable in this band. |
| **92-94**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>RADIOLOCATION<br>S5.149 S5.556 | **92-94**<br>FIXED<br>~~FIXED-SATELLITE (Earth-to-space)~~<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>RADIOLOCATION<br>MOD S5.149 ~~S5.556~~ | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide. RAS interest up to now recognised via footnote.<br>No change in sharing between services, except for introduction of RAS allocation in band.<br>Full band added to those listed under S5.149 |

| GHz<br>71 -126 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/ Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **94-94.1**<br>RADIOLOCATION<br>EARTH EXPLORATION-SATELLITE (active)<br>SPACE RESEARCH (active)<br>S 5.562 | **94-94.1**<br>RADIOLOCATION<br>EARTH EXPLORATION-SATELLITE (active)<br>SPACE RESEARCH (active)<br>Radio Astronomy<br>S 5.562 | Radio astronomy secondary to active services.<br>No change in sharing between services, except for introduction of RAS allocation in band. |
| **94.1-95**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>RADIOLOCATION<br>S5. 149 S5.556 | **94.1-95**<br>FIXED<br>~~FIXED-SATELLITE (Earth-to-space)~~<br>MOBILE<br>RADIOLOCATION<br>RADIO ASTRONOMY S.5.ZZZ<br>MOD S5. 149 ~~S5.556~~ | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>No change in sharing between services, except for introduction of RAS allocation in band.<br>Footnote S5.556 is not relevant to this band and should have been suppressed as a consequence of WRC-97 actions.<br>Band added to those listed under S5.149<br>FSS (Earth-to-space) allocation no longer needed to balance 102-105 GHz relocated to 71-76 GHz band. |
| **95-100**<br>MOBILE S5.553<br>MOBILE-SATELLITE<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>Radiolocation<br>S5.149 S5.554 S5.555 | **95-100**<br>FIXED MOD S5.553<br>MOBILE MOD S5.553<br>MOBILE-SATELLITE (Earth-to-space)<br>RADIO ASTRONOMY S5.ZZZ<br>RADIOLOCATION<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>~~Radiolocation~~<br>MOD S5.149 S5.554 ~~S5.555~~ | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide. Primary allocation to RAS at 97.88-98.08 GHz (footnote S5.555), for observations of 97.98 GHz CS line, no longer needed.<br>Radiolocation upgraded to primary, consequential to the RAS upgrade.<br>Band added to those listed under S5.149.<br>Band deleted from footnote S5.555, which allocates the 97.88-98.08 subband to the RAS on a primary basis.<br>Fixed allocation added, to keep FS totals unchanged.<br>S5.553 modified to include stations in the fixed service |

| GHz<br>71 -126 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/ Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **100 – 102**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>MOBILE<br>SPACE RESEARCH (passive)<br>S5.341 | **100 – 102**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>SPACE RESEARCH (passive)<br>MOD S5.149 S5.341 | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide.<br>No change in sharing between services, except for introduction of RAS allocation in band.<br>Used by EES (passive) for limb sounding of atmospheric constituents (NO line at 100.49 GHz).<br>Band added to those listed under S5.149 |
| **102-105**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>S5.341 | **102-105**<br>FIXED<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>MOD S5.149 S5.341 | FSS allocation moved to 71-73 GHz band, to eliminate downlinks in the middle of the atmospheric window.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide.<br>Band added to those listed under S5.149 |

| GHz<br>71 -126 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/ Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **105-116**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 S5.341 | **105 – ~~116~~ 109.5**<br>~~EARTH EXPLORATION-SATELLITE (passive)~~<br>RADIO ASTRONOMY S5.ZZZ<br>SPACE RESEARCH (passive) S5.CCC<br>FIXED<br>MOBILE<br>~~S5.340~~ MOD S5.149 S5.341 | Passive sensors have no known use for, and do not need the band 105-109.5 GHz.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ, satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide.<br>Addition of the fixed and mobile services, relocated from 116 - 122.5 GHz band, where deletion of these services is needed to protect essential passive sensor operations<br>Band no longer passive, consequently S5.340 should be deleted.<br>Band added to those included under S5.149.<br>New footnote S5.CCC limits Space Research (passive) allocation to space-based radio astronomy in this band. |
| | **109.5 – 111.8**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 S5.341 | **NOC**<br>Ozone line at 110.8 GHz used for microwave limb sounding.<br>The 109.5-111.8 GHz band is of vital importance to radio astronomy for observations of the CO lines at 109.8 and 110.2 GHz, and for continuum observations. |
| | **111.8-114.25**<br>~~EARTH EXPLORATION-SATELLITE (passive)~~<br>FIXED<br>MOBILE<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive) ADD S5.CCC<br>S5.341 MOD S5.149 | Passive sensors do not need the band 111.8--114.25 GHz.<br>Addition of the fixed and mobile services, relocated from 116 - 122.5 GHz band, where deletion of these services is needed to protect essential passive sensor operations.<br>Band added to those included under S5.149.<br>New footnote S5.CCC limits Space Research (passive) allocation to space-based radio astronomy in this band. |
| | **114.25-116**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 S5.341 | **NOC**<br>The band 114.25-116 GHz is of vital importance to radio astronomy for observations of the 115.3 GHz CO line. |

| **GHz**<br>**71 -126 (continued)** | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change/ Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **116 – 119.98**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>SPACE RESEARCH (passive)<br>S5.138 S5.341 | **116 -119.98**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~FIXED~~<br>INTER-SATELLITE S5.XXX<br>~~MOBILE S5.558~~<br>SPACE RESEARCH (passive)<br>~~S5.138~~ S5.341 | This band is of crucial importance for passive sensing, as it is the lower flank of the oxygen absorption band, with peak at 118.75 GHz. The associated reference window is the 86-92 GHz band. Fixed and mobile services moved down to 105 - 109.5 GHz, as sharing with passive sensors would severely restrict their operation in this band. ISS needs to be limited by footnote S5.XXX to links between GSO satellites only, with pfd limits as specified in sharing studies.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ, satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations, world-wide.<br>S5.138 deleted, it is considered to be a misprint in the RR. |

| **GHz**<br>**71 -126 (continued)** | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1, 2, 3 | Regions 1, 2, 3 | |
| **119.98 – 120.02**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>SPACE RESEARCH (passive)<br>Amateur<br>S5.138 S5.341 | **119.98 – 120.02**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~FIXED~~<br>INTER-SATELLITE S5.XXX<br>~~MOBILE S5.558~~<br>SPACE RESEARCH (passive)<br>~~Amateur~~<br>~~S5.138~~ S5.341 | This band is of crucial importance for passive sensing, as it is part of the upper flank of the oxygen absorption band, with peak at 118.75 GHz. The associated reference window is the 86-92 GHz band. Fixed and mobile services moved down to 105 - 109.5 GHz, as sharing with passive sensors would severely restrict them in this band.<br>ISS needs to be limited by footnote S5.XXX to links between GSO satellites only, with pfd limits as specified in sharing studies.<br>Secondary allocation to amateur service is also moved to 122.5-126 GHz band, to avoid interference to passive sensors. |
| **120.02 – 126**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>SPACE RESEARCH (passive)<br>S5.138 S5.341 | **120.02 – 122.25**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~FIXED~~<br>INTER-SATELLITE S5.XXX<br>~~MOBILE S5.558~~<br>SPACE RESEARCH (passive)<br>S5.138 ~~S5.341~~ | This band is of crucial importance for passive sensing, as it is the lower flank of the oxygen absorption band, with peak at 118.75 GHz. The associated reference window is the 86-92 GHz band. Fixed and mobile services moved down to 105 - 109.5 GHz, as sharing with passive sensors would severely restrict them in this band.<br>ISS needs to be limited by footnote S5.XXX to links between GSO satellites only, with pfd limits as specified in sharing studies. |
| | **122.25-126**<br>~~EARTH EXPLORATION-SATELLITE (passive)~~<br>FIXED<br>INTER-SATELLITE<br>MOBILE MOD S5.558<br>~~SPACE RESEARCH (passive)~~<br>RADIO ASTRONOMY S5.ZZZ<br>Amateur<br>S5.138 ~~S5.341~~ | Band not needed by passive sensors.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Secondary amateur service allocation added o compensate loss at 119.98-120.02 GHz |

| GHz<br>126-200 | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **126-134**<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5. 558<br>RADIOLOCATION S5. 559 | **126-134**<br>~~FIXED~~<br>FIXED-SATELLITE (space-to-Earth)<br>INTER-SATELLITE<br>~~MOBILE S5.558~~<br>MOBILE-SATELLITE<br>~~RADIOLOCATION S5. 559~~<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>Radiolocation<br>MOD S5.554 | Satellite downlinks from 141-153 GHz band moved here to avoid interference to the Radio Astronomy Service.<br>Fixed, mobile and radiolocation allocations moved to 141-153 GHz band.<br><br>Sharing conditions between the ISS and the FSS, MSS, RNS and RNSS services need to be developed, but no imminent use of the band by these services is contemplated.<br><br>MSS directional indicator left undefined.<br>Footnote S5.554 suitably modified.<br>Band deleted from S5.559 |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **134-142**<br>MOBILE S5.553<br>MOBILE-SATELLITE<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>Radiolocation<br>S5.149 S5.340 S5.554 S5.555 | **134-136**<br>AMATEUR<br>AMATEUR-SATELLITE<br>~~MOBILE S5.553~~<br>~~MOBILE-SATELLITE~~<br>~~RADIONAVIGATION~~<br>~~RADIONAVIGATION-SATELLITE~~<br>Radio Astronomy<br>~~Radiolocation~~<br>~~S5.149 S5.340 S5.554 S5.555~~ | Amateur and amateur-satellite services moved here from 142-144 GHz band to avoid interference to radio astronomy at higher frequencies.<br><br>Radio astronomy added as secondary service to reflect coordination requirement with the amateur-satellite service. |
| | **136 - 141**<br>~~MOBILE S5.553~~<br>~~MOBILE-SATELLITE~~<br>RADIO ASTRONOMY S5.ZZZ<br>RADIOLOCATION<br>~~RADIONAVIGATION~~<br>~~RADIONAVIGATION-SATELLITE~~<br>Amateur<br>Amateur-Satellite<br>~~Radiolocation~~<br>**MOD** S5.149 ~~S5.340~~ ~~S5.554~~ ~~S5.555~~ | Services from 144 -149 GHz band moved here.<br><br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br><br>Band added to those listed under S5.149.<br><br>Band no longer passive and removed from S5.340<br><br>S5.554 is no longer relevant to this band.<br><br>S5.555 modified to reflect primary status of the RAS in the full 136-141 GHz band. |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **142 - 144**<br>AMATEUR<br>AMATEUR-SATELLITE | **141 - 148.5**<br>~~AMATEUR~~<br>~~AMATEUR-SATELLITE~~<br>FIXED<br>MOBILE ~~S5.553~~<br>~~MOBILE-SATELLITE~~<br>RADIO ASTRONOMY S5.ZZZ<br>RADIOLOCATION<br>~~RADIONAVIGATION~~<br>~~RADIONAVIGATION-SATELLITE~~<br>~~Amateur~~<br>~~Amateur-Satellite~~<br>~~Radiolocation~~<br>MOD S5.149 ~~S5.340~~ ~~S5.555~~ | Allocations transferred to this band from 126-134 GHz band. Bandwidth reduced to 7.5 GHz to accommodate EES (passive) and SR (passive) requirements in 148.5-151.5 GHz band.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band no longer passive, so band deleted from those listed under S5.340.<br>Band added to those listed under S5.149<br>S5.555 no longer refers to any portion of this band. |
| **144 - 149**<br>RADIOLOCATION<br>Amateur<br>Amateur-Satellite<br>S 5.149 S5.555 | | |
| **149-150**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE | | |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **150-151**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>SPACE RESEARCH (passive)<br>S5.149 S5.385 | **148.5 - 151.5**<br>EARTH EXPLORATION SATELLITE (passive)<br>~~FIXED~~<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>~~MOBILE~~<br>RADIO ASTRONOMY<br>~~RADIOLOCATION~~<br>SPACE RESEARCH (passive)<br>~~Amateur~~<br>~~Amateur-Satellite~~<br>~~S 5.149 S 5.385 S5.555~~ MOD S5.340 | Current passive allocation of 150-151 GHz has insufficient bandwidth and is not adequately protected from interference.<br>Band no longer listed in S5.149.<br>Band purely passive, added to those listed under S5.340<br>S5.555 no longer refers to any portion of this band. |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **151-156**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE | **151.5-153**<br>FIXED<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>RADIOLOCATION<br>MOD S5.149 | FSS downlink allocation incompatible with primary radio astronomy requirement. Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under S5.149<br>Radiolocation allocation compensates for removal from 126-134 GHz band.<br>Restrictions of S5. 559 no longer apply, footnote suitably modified. |
| | **153-155.5**<br>FIXED<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>SPACE RESEARCH (passive) S5.CCC | FSS downlink allocation incompatible with primary radio astronomy requirement.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under S5.149<br>Space Research (passive) allocation limited to space-based radio astronomy in this band. |
| **156-158**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE | **155.5-158.5**<br>EARTH EXPLORATION-SATELLITE (passive) S5.AAA<br>FIXED S5.BBB<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>MOBILE S5.BBB<br>RADIO ASTRONOMY S5.ZZZ<br>SPACE RESEARCH (passive) S5.CCC | FSS downlink allocation incompatible with primary radio astronomy requirement.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under S5.149<br>EES operations in the band 155.5-158.5 GHz need to be protected until 1/1/2018. After this date the fixed and mobile services need to co-ordinate with radio astronomy sites only.<br>Space Research (passive) allocation limited to space-based radio astronomy in this band. |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **158 -164**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE | **158.5- 164**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>MOBILE-SATELLITE (space-to-Earth) | MSS allocation, compatible with FSS downlink added. |
| **164 - 168**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive) | **164 - ~~168~~ 167**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>MOD S5.340 | **NOC**<br>Passive sensors require only a 3 GHz band from 164-167 GHz. This band, along with the band 148.5-151.5 GHz will become the harmonised reference window for passive sensor observations of the 183.31 GHz water vapour line. The band is also used for microwave limb sounding of the 164.38 GHz CO line.<br>Band added to those listed under S5.340. |
| | **167 - 168**<br>~~EARTH EXPLORATION-SATELLITE (passive)~~<br>FIXED<br>FIXED SATELLITE (space-to-Earth)<br>INTER-SATELLITE<br>MOBILE S5.558<br>~~RADIO ASTRONOMY~~<br>~~SPACE RESEARCH (passive)~~ | Passive services do not need this band.<br>Fixed, mobile, inter-satellite and fixed-satellite uplinks added. |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations<br>Regions 1,2,3 | Proposed Allocations<br>Regions 1,2,3 | Reason for Change / Remarks |
| **168 – 170**<br>FIXED<br>MOBILE | **168 - 174.8**<br>~~EARTH EXPLORATION-SATELLITE (passive)~~<br>FIXED<br>FIXED SATELLITE (space-to-Earth)<br>INTER-SATELLITE<br>MOBILE S5.558<br>~~RADIO ASTRONOMY~~<br>~~SPACE RESEARCH (passive)~~<br>~~S5.149 S5.385~~ | Band not needed for passive uses.<br>FSS (space-to-Earth) added, to compensate for loss of 151-158 GHz band in middle of atmospheric window. Atmospheric absorption ~0.5 dB higher than at 151-158 GHz region.<br>Band deleted from those listed under S5.149 and S5.385. |
| **170-174.5**<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>S5.149 S5.385 | | |
| **174.5-176.5**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>SPACE RESEARCH (passive)<br>S5.149 S5.385 | **174.8-176.5**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~FIXED~~<br>INTER-SATELLITE S5.YYY<br>~~MOBILE S5.558~~<br>SPACE RESEARCH(passive)<br>~~S5.149 S5.385~~ | The band 174.8-191.8 GHz is of crucial importance for passive sensing of the water vapour absorption line whose peak is at 183.31 GHz. Sharing with fixed and mobile services is not possible, so they need to be reallocated. The ISS service needs to be limited to links between GSO satellites and to a pfd limit as specified in sharing studies.<br>Band deleted from those listed under S5.149. |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **176.5-182**<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>S5.149 S5.385 | **176.5-182**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~FIXED~~<br>INTER-SATELLITE S5.YYY<br>~~MOBILE S5.558~~<br>SPACE RESEARCH (passive)<br>MOD S5.149 S5.385 | This band is of crucial importance for passive sensing of the water vapor absorption line whose peak is at 183.31 GHz. Sharing with fixed and mobile services is not possible, so they need to be reallocated. The ISS service needs to be limited to links between GSO satellites and to a pfd limit as specified in sharing studies.<br>The band 174.8-191.8 GHz is required for sensing of the water vapour absorption line whose peak is at 183.31 GHz. |
| **182-185**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 S5.563 | **182-185**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~RADIO ASTRONOMY~~<br>SPACE RESEARCH (passive)<br>MOD S5.340 S5.563 MOD S5.149 | No terrestrial radio astronomy use of the band is possible due to high atmospheric absorption. Radio astronomy observations of the water vapor line from space are conducted in this band under the Space Research (passive) allocation.<br>The band 174.8-191.8 GHz is required for sensing of the water vapour absorption line whose peak is at 183.31 GHz. |

| GHz<br>126-200 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **185-190**<br>FIXED<br>INTER-SATELLITE<br>MOBILE S5.558<br>S5.149 S5.385 | **185-190**<br>EARTH EXPLORATION SATELLITE (passive)<br>~~FIXED~~<br>INTER-SATELLITE S5.YYY<br>~~MOBILE S5.558~~<br>SPACE RESEARCH (passive)<br>~~S5.149~~ S5.385 | This band is of crucial importance for passive sensing of the water vapor absorption line whose peak is at 183.31 GHz. Sharing with fixed and mobile services is not possible, so they need to be reallocated. The ISS service needs to be limited to links between GSO satellites and to a pfd limit as specified in sharing studies.<br>Band deleted from those listed in S5.149. |
| **190 – 200**<br>MOBILE S5.553<br>MOBILE-SATELLITE<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>S5.341 S5.554 | **190 - 191.8**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~MOBILE S5.553~~<br>~~MOBILE-SATELLITE (space-to-Earth)~~<br>~~RADIONAVIGATION~~<br>~~RADIONAVIGATION-SATELLITE~~<br>SPACE RESEARCH (passive)<br>~~S5.341~~ ~~S5.554~~ MOD S5.340 | This band is of crucial importance for passive sensing of the water vapor absorption line whose peak is at 183.31 GHz. Sharing with the mobile, mobile-satellite, RN and RNs services is not possible, and they need to be reallocated.<br>S5.554 deleted from this band, to reflect deletion of active services, and modified to reflect change.<br>S5.341 does not apply to this band.<br>S5.340 modified to include this band. |
| | **191.8-200**<br>FIXED MOD S5.553<br>INTER-SATELLITE<br>MOBILE MOD S5.553<br>MOBILE-SATELLITE<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>S5.341 MOD S5.554 | S5.553 and S5.554 modified, to reflect deletion of terrestrial services from 190.0 -191.8 GHz band.<br>S5.553 modified to include stations in the fixed service. |

| GHz<br>200-275 | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **200-202**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>MOBILE<br>SPACE RESEARCH (passive)<br>S5.341 | **200-202**<br>EARTH EXPLORATION-SATELLITE (passive)<br>[FIXED]<br>[MOBILE]<br>SPACE RESEARCH (passive)<br>RADIO ASTRONOMY [ S5.ZZZ]<br>S5.341 [MOD S5.340] | Band needed by EES service for atmospheric chemistry (limb sounding) and atmospheric remote sensing of nitrous oxide at 201 GHz. Fixed and mobile services may need to be relocated from this band after results of sharing studies with EESS are known.<br>Radio astronomy allocation [and new footnote S5.ZZZ, along with RES ZZZ,] satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.[Band added to those listed under S5.340] |

| GHz<br>200-275 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **202-217**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>S5.341 | **202 – 2~~17~~ 209**<br>EARTH EXPLORATION-SATELLITE (passive)<br>[FIXED]<br>~~FIXED-SATELLITE (Earth-to-space)~~<br>[MOBILE]<br>RADIO ASTRONOMY [ S5.ZZZ]<br>SPACE RESEARCH (passive)<br>S5.341 [MOD S5.340] | Band needed by EES service for atmospheric chemistry (limb sounding) and atmospheric remote sensing of water vapor at 203.4 GHz and ozone at 208.5 GHz. FSS (Earth-to-space) service relocated from this band to 217-226 GHz band. Fixed and mobile services may need to be relocated from this band after results of sharing studies with EESS are known.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>[Band added to those listed under S5.340] |
| | **209 – 217**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>RADIO ASTRONOMY S5.ZZZ<br>S5.341 MOD S5.149 | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under MOD S5.149 |

| GHz<br>200-275 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **217-231**<br>EARTH EXPLORATION-SATELLITE (passive)<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>S5.340 S5.541 | **217 – ~~231~~ 226**<br>~~EARTH EXPLORATION-SATELLITE (passive)~~<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>RADIO ASTRONOMY ADD S5.ZZZ<br>~~SPACE RESEARCH (passive)~~<br>S5.341 MOD S5.149 ~~S5.340~~ | Passive sensor allocation can be deleted from this band.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under MOD S5.149<br>Band no longer passive, S5.340 deleted. |
| | **~~217~~ 226 - ~~231~~ 231.5**<br>EARTH EXPLORATION-SATELLITE (passive)<br>~~FIXED~~<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>~~MOBILE~~<br>RADIO ASTRONOMY<br>SPACE RESEARCH (passive)<br>~~Radiolocation~~<br>**MOD** S5.340 S5.341 | Passive sensors do not require exclusive use of the 217-231 GHz band; only the 226-231.5 GHz portion is required for limb sounding of atmospheric constituents. In addition, the band provides a 4 GHz reference window for higher frequency water vapor measurements.<br>This band is of vital importance to the radio astronomy service for observations of the 230.5 GHz CO line.<br>S5.340 modified to take into account that 217-226 GHz band is no longer passive.<br>The FS, FSS (s-E), and MS services have been reallocated from the 231-231.5 GHz portion of the band. |
| **231 – 235**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>Radiolocation | **~~231~~ 231.5 - 235**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>Radiolocation | See previous band adjustment. |

| GHz<br>200-275 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **235-238**<br>EARTH EXPLORATION-SATELLITE (passive)<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>SPACE RESEARCH (passive) | **235-238**<br>EARTH EXPLORATION-SATELLITE (passive)<br>[FIXED]<br>~~FIXED-SATELLITE (space-to-Earth)~~<br>[MOBILE]<br>RADIO ASTRONOMY [S5.ZZZ]<br>SPACE RESEARCH (passive)<br>[S5.340] | Passive sensors are limited to microwave limb sounding in the band 235-238 GHz.<br>FSS (space-to-Earth) reallocated elsewhere.<br>Fixed and mobile services may need to be relocated from this band after results of sharing studies are known.<br>S5.340 to be added if all active services need to be relocated.<br>Radio astronomy allocation satisfies requirement for radio astronomy spectral line and wide band continuum observations.<br>New footnote S5.ZZZ, along with RES ZZZ to be added, if active services does not require to be reallocated. |
| **238-241**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>Radiolocation | **238-241**<br>FIXED<br>FIXED-SATELLITE (space-to-Earth)<br>MOBILE<br>Radiolocation | Sharing scenario between services preserved**.** |
| **241-248**<br>RADIOLOCATION<br>Amateur<br>Amateur-Satellite<br>S5.138 | **241-248**<br>RADIOLOCATION<br>RADIO ASTRONOMY S5.ZZZ<br>Amateur<br>Amateur-Satellite<br>S5.138 MOD S5.149 | Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under MOD S5.149<br>No change in sharing between services, except for introduction of RAS allocation in band. |

| GHz<br>200-275 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **248-250**<br>AMATEUR<br>AMATEUR-SATELLITE | **248 -250**<br>AMATEUR<br>AMATEUR-SATELLITE<br>Radio Astronomy | RAS added on a secondary basis, to reflect co-ordination requirement with amateur-satellite service.<br>No change in sharing between active services. |
| **250-252**<br>EARTH EXPLORATION-SATELLITE (passive)<br>SPACE RESEARCH (passive)<br>S5.149 S5.555 | **250 - 252**<br>EARTH EXPLORATION-SATELLITE (passive)<br>SPACE RESEARCH (passive)<br>RADIO ASTRONOMY<br>~~S5.149~~ ~~S5.555~~ MOD S5.340 | Limb sounding of nitrous oxide near 251 GHz. Add radio astronomy to the other passive services.<br>S5.149 and S5.555 may be deleted. Addition of another passive service does not alter sharing scenario.<br>S5.340 modified to reflect passive nature of band. |
| **252-265**<br>MOBILE S5.553<br>MOBILE-SATELLITE<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>S5.149 S5.385 S5.554 S5.555 S5.564 | **252-265**<br>[FIXED MOD S5.553]<br>MOBILE MOD S5.553<br>MOBILE-SATELLITE (Earth-to-space)<br>RADIONAVIGATION<br>RADIONAVIGATION-SATELLITE<br>RADIO ASTRONOMY S5.ZZZ<br>MOD S5.149 ~~S5.385~~ MOD S5.554 ~~S5.555~~ ~~S5.564~~ | Directional indicator added to MSS allocation, paired with 190-200 GHz band. Atmospheric absorption in this band is relatively constant and higher than in the paired downlink band.<br>Radio astronomy allocation and new footnote S5.ZZZ, along with RES ZZZ satisfy requirement for radio astronomy spectral line (secondary allocation to radio astronomy at 257.5 - 258 GHz deleted) and wide band continuum observations from a few remote locations world-wide.<br>Band added to those listed under MOD S5.14.<br>Band deleted from S5.385. S5.564 no longer needed. |

| GHz<br>200-275 (continued) | | |
|---|---|---|
| Current Allocations | Proposed Allocations | Reason for Change / Remarks |
| Regions 1,2,3 | Regions 1,2,3 | |
| **265-275**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>RADIO ASTRONOMY<br>S5.149 | **265-275**<br>FIXED<br>FIXED-SATELLITE (Earth-to-space)<br>MOBILE<br>RADIO ASTRONOMY S 5.ZZZ<br>MOD S5.149 | Footnote S5.ZZZ added to Radio Astronomy allocation in this band. |
| **275-400**<br>(Not allocated) S5.565 | **275-400**<br>(Not allocated) MOD S5.565 | Change upper limit for applicability of footnote MOD S5.565, to account for various passive service needs above 275 GHz.<br>Many lines and windows for radio astronomy and EES applications above 275 GHz. |

## Footnotes Applicable in the 71 - 1000 GHz Frequency Range

**S5.138** The following bands:

6 765 - 6 795 kHz (center frequency 6 780 kHz),

433.05 - 434.79 MHz (center frequency 433.92 MHz) in Region 1 except in the countries mentioned in No S5.280,

61 - 61.5 GHz (center frequency 61.25 GHz),

122 - 123 GHz (center frequency 122.5 GHz), and

244 - 246 GHz (center frequency 245 GHz)

are designated for industrial, scientific and medical (ISM) applications. The use of these frequency bands for ISM applications shall be subject to special authorization by the administration concerned, in agreement with other administrations whose radiocommunication services might be affected. In applying this provision, administrations shall have due regard to the latest relevant ITU-R Recommendations.

**MOD S5.149** In making assignments to stations of other services to which the bands:

| | | |
|---|---|---|
| 13 360-13 410 kHz, | 22.01-22.21 GHz*, | 111.8-114.25 GHz, |
| 25 550-25 670 kHz, | 22.21-22.5 GHz, | 140.69-140.98 GHz*, |
| 37.5-38.25 MHz, | 22.81-22.86 GHz*, | 141-148.5 GHz, |
| 73-74.6 MHz | 23.07-23.12 GHz*, | 148.5-151.5 GHz, |
| in Regions 1 and 3, | 31.2-31.3 GHz, | ~~144.68-144.98 GHz*,~~ |
| 150.05-153 MHz in | 31.5-31.8 GHz in | ~~145.45-145.75 GHz*,~~ |
| Region 1, | Regions 1 and 3, | ~~146.82-147.12 GHz*,~~ |
| 322-328.6 MHz*, | 36.43-36.5 GHz*, | ~~150-151 GHz*,~~ |
| 406.1-410 MHz, | 42.5-43.5 GHz, | 174.42-175.02 GHz*, |
| 608-614 MHz in | 42.77-42.87 GHz*, | 177-177.4 GHz*, |
| Regions 1 and 3, | 43.07-43.17 GHz*, | 178.2-178.6 GHz*, |
| 1 330-1 400 MHz*, | 43.37-43.47 GHz*, | 181-181.46 GHz*, |
| 1 610.6-1 613.8 MHz*, | 48.94-49.04 GHz*, | ~~186.2-186.6 GHz*,~~ |
| 1 660-1 670 MHz, | ~~72.77-72.91 GHz*,~~ | 209-226 GHz, |
| 1 718.8-1 722.2 MHz*, | 76.5-81.5 GHz, | ~~250-251 GHz*,~~ |
| 2 655-2 690 MHz, | 81.5-84.5 GHz, | ~~257.5-258 GHz*,~~ |
| 3 260-3 267 MHz*, | 84.5-86 GHz, | ~~261-265 GHz,~~ |
| 3 332-3 339 MHz*, | ~~93.07-93.27 GHz*,~~ | ~~262.24-262.76 GHz*,~~ |
| 3 345.8-3 352.5 MHz*, | 92-94 GHz, | 252-265 GHz, |
| 4 825-4 835 MHz*, | 94.1-95 GHz, | 265-275 GHz, |
| 4 950-4 990 MHz, | 95-100 GHz, | ~~265.64-266.16 GHz*,~~ |
| 4 990-5 000 MHz, | 100-102 GHz, | ~~267.34-267.86 GHz*,~~ |
| 6 650-6 675.2 MHz*, | ~~97.88-98.08 GHz*,~~ | ~~271.74-272.26 GHz*~~ |
| 10.6-10.68 GHz, | 102-105 GHz, | |
| 14.47-14.5 GHz*, | 105-109.5 GHz, | |

are allocated (* indicates radio astronomy use for spectral line observations), administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. S4.5 and S4.6 and Article S29).

**MOD S5.340** All emissions are prohibited in the following bands:

| | |
|---|---|
| 1 400-1 427 MHz, | |
| 2 690-2 700 MHz | except those provided for by Nos. **S5.421** and **S5.422**, |
| 10.68-10.7 GHz | except those provided for by No. **S5.483**, |
| 15.35-15.4 GHz | except those provided for by No. **S5.511**, |
| 23.6-24 GHz, | |
| 31.3-31.5 GHz, | |
| 31.5-31.8 GHz | in Region 2, |
| 48.94-49.04 GHz | from airborne stations, |
| 50.2-50.4 GHz[1] | except those provided for by No. **S5.555A**, |
| 52.6-54.25 GHz, | |
| 86-92 GHz, | |
| ~~105-116 GHz,~~ | |
| 109.5-111.8 GHz, | |
| 114.25-116 GHz, | |
| 140.69-140.98 GHz | from airborne stations and from space stations in the space-to-Earth direction, |
| 148.5-151.5 GHz, | |
| 164-167 GHz, | |
| 182-185 GHz | except those provided for by No. **S5.563**, |
| 190-191.8 | |
| 200-202 GHz, | |
| [202-209 GHz,] | |
| ~~217-228 GHz~~ | |
| 226-231.5 GHz, | |
| [235-238] | |
| 250-252 GHz | |

**S5.341** In the bands 1 400 - 1 727 MHz, 101 - 120 GHz and 197 - 220 GHz, passive research is being conducted by some countries in a program for the search for intentional emissions of extraterrestrial origin.

**MOD S5.385** *Additional allocation:* the bands 1 718.8 - 1 722.2 MHz, ~~150 - 151 GHz, 174.42 - 175.02 GHz,~~ 177 - 177.4 GHz, 178.2 - 178.6 GHz, 181 - 181.46 GHz, and 186.2 - 186.6 GHz ~~and 257.5 - 258 GHz~~ are also allocated to the radio astronomy service on a secondary basis for spectral line observations.

**MOD S5.553** In the bands 43.5 - 47 GHz, 66 - 71 GHz, 95 - 100 GHz, ~~134 - 142 GHz,~~ ~~190~~191.8 - 200 GHz and 252 - 265 GHz, stations in the fixed and land mobile services may be operated subject to not causing harmful interference to the space radiocommunication services to which these bands are allocated (see No. **S5.43**).

**MOD S5.554** In the bands 43.5 - 47 GHz, 66 - 71 GHz, 95 -100 GHz, ~~134 - 142~~ 126 – 134 GHz, ~~190~~191.8 - 200 GHz and 252 - 265 GHz, satellite links connecting land stations at specified fixed points are also authorized when used in conjunction with the mobile-satellite service or the radionavigation-satellite service.

**MOD S5.555** *Additional allocation:* the bands 48.94 - 49.04 GHz~~, 97.88 - 98.08 GHz, 140.69 - 140.98 GHz, 144.68 - 144.98 GHz, 145.45 - 145.75 GHz, 146.82 - 147.12 GHz, 250 - 251 GHz and 262.24 - 262.76 GHz are~~ is also allocated to the radio astronomy service on a primary basis.

**MOD S5.556** In the bands 51.4 - 54.25 GHz, 58.2 - 59 GHz~~,~~ and 64 - 65 GHz~~, 72.77 - 72.91 GHz and 93.07 - 93.27 GHz~~, radio astronomy observations may be carried out under national arrangements.

**MOD S5.558** In the bands 55.78-58.2 GHz, 59-64 GHz, 66-71 GHz, ~~123-134~~ 122.5-126 GHz, 170-182 GHz and 185-190 GHz, stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service (see No. **S5.43**).

**MOD S5.559** In the band~~s~~ 59 -64 GHz ~~and 126 - 134 GHz,~~ airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service (see No. **S5.43**)

**S5.560** In the band 78 - 79 GHz radars located on space stations may be operated on a primary basis in the earth exploration-satellite service and in the space research service.

**MOD S5.561** In the band ~~84 - 86~~ 71-73 GHz, stations in the fixed~~,~~ and mobile ~~and broadcasting~~ services shall not cause harmful interference to broadcasting-satellite stations operating in accordance with the decisions of the appropriate frequency assignment planning conference for the broadcasting-satellite service.

**S5.562** The use of the band 94-94.1 GHz by the earth exploration-satellite (active) and space research (active) services is limited to spaceborne cloud radars.

**SUP S5.564** *Additional allocation:* in Germany, Argentina, Spain, Finland, France, India, Italy, the Netherlands and Sweden, the band 261 - 265 GHz is also allocated to the radio astronomy service on a primary basis.

**MOD S5.565** The frequency band 275 - 400 GHz may be used by administrations for experimentation with, and development of, various active and passive services. In this band a need has been identified for the following spectral line measurements for passive services:

**Please note that other bands will be added to the radio astronomy list in this footnote**

— radio astronomy service: 278 - 280 GHz and 343 - 348 GHz;

— space research service (passive) and earth exploration-satellite service (passive): 275 - 277 GHz, ~~300~~299 - 30~~26~~ GHz, 3~~24~~16 - 3~~26~~34 GHz, 3~~45~~39 - 34~~7~~8 GHz, 363 - 365 GHz~~, and~~ 37~~9~~1.5 - 3~~81~~78.5 GHz, 409 - 411 GHz, 419 - 430 GHz, 443 - 444 GHz, 485 - 487 GHz, 498 - 505 GHz, 523 - 527 GHz, 538 - 584 GHz, 624 - 629 GHz, 640 - 653 GHz and 951 - 956 GHz.

**ADD S5.XXX** Use of the bands 116-123 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density, at all altitudes from 0 km to 1 000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -148 dBW/m$^2$/MHz for all angles of arrival.

**ADD S5.AAA** In the band 155.5-158.5 GHz, the allocation to the Earth exploration-satellite (passive) and space research (passive) services shall terminate on 1 January 2018.

**ADD S5.BBB** The date of entry for the allocation to the fixed and mobile services in the band 155.5 – 158.5 GHz shall be 1 January 2018.

**ADD S5.CCC** Use of this allocation is limited to space-based radio astronomy only.

**ADD S5.YYY** Use of the bands 174.5-182 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density, at all altitudes from 0 km to 1 000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -144 dBW/m$^2$/MHz for all angles of arrival.

**ADD S5.ZZZ** Use of this band by the radio astronomy service shall be in accordance with the terms of Resolution ZZZ

## RESOLUTION ZZZ

## USE OF THE BANDS [ ] BY THE RADIO ASTRONOMY SERVICE

The World Radiocommunication Conference (Istanbul, 2000),

*considering*

*a)* that a large number of spectral lines of astrophysical interest above 71 GHz provide unique information about cosmic processes, such as the chemistry of the interstellar medium and the formation of stars and planets, and that this information cannot be obtained from any other source;

*b)* that Doppler shifted lines, which are also of great interest for astronomical studies, are found far removed from the rest frequency of some spectral lines and that highly Doppler shifted lines may offer the only means to obtain information about the very early Universe and the formation of galaxies;

*c)* that mm-wave radio astronomy receivers are designed to cover substantial portions of the atmospheric windows above 70 GHz to take advantage of the information contained in spectral lines, as well as in continuum radiation;

*d)* that several Administrations operate mm-wave radio astronomy observatories and that some are building or are planning to build a limited number of large new facilities to exploit the most advanced technologies; and that these facilities are intended to serve the needs of the worldwide scientific community;

*f)* that mm-wave observatories must be located on high mountain tops or plateaus to take advantage of the driest possible atmospheric conditions necessary to obtain high quality observations; and require substantial investments on behalf of the scientific communities concerned, and that therefore their number will remain low,

*noting*

that sharing between the radio astronomy service and other terrestrial services operating in bands above 71 GHz is facilitated by the natural attenuation provided by atmospheric gases, and that it can be further facilitated by adequate geographic separation,

*urges:*

Administrations to establish coordination zones around mm-wave radio astronomy sites operating in bands above 71 GHz. Coordination zone radii should be determined following the procedure outlined in Rec. ITU-R RA.1031-1, separately for ground based

transmitters, airborne transmitters and transmitters that may be located on High Altitude Platforms (HAPS).

*resolves:*

1. that in the frequency bands referred to in this Resolution, co-primary status of the radio astronomy service shall be recognized within coordination zones established by Administrations. No coordination requirements should be imposed upon terrestrial services outside established coordination zones.

2. that in the bands referred to in this Resolution, co-primary services operating stations within a coordination zone should coordinate their operations with affected radio astronomy stations within five years of the date of notification of the radio astronomy site to the Radiocommunication Bureau

Annex 1 lists the radio astronomy sites that operate, or plan to operate in the bands referred to in this Resolution as of [June 8, 2000]. Observatories that operate only up to 92 GHz are identified with *** under the SITE column.

**[ Annex 1 ]***

## List of Radio Astronomical Observatories Operating in Bands Above 71 GHz

### REGION 1

| COUNTRY | SITE | LONG o ' " | LAT o ' " | ALT (m) | DIAM (m) | REMARKS |
|---|---|---|---|---|---|---|
| Finland | Metsahovi | 24 23 17 | 60 13 04 | 61 | 13.7 | |
| France | Bordeaux | -00 31 37 | 44 50 10 | 73 | 2.5 | |
| | Plateau de Bure[1] | 05 54 26 | 44 38 01 | 2552 | 15 | |
| Germany | Effelsberg | 06 53 00 | 50 31 32 | 369 | 100 | |
| Italy | Medicina*** | 11 38 43 | 44 31 14 | 44 | 32 | EVLBI |
| | Noto*** | 15 03 00 | 36 31 48 | | | EVLBI |
| Russia | Zelenchukskaya | 41 26 30 | 43 39 12 | 2100 | | |
| Spain | Pico Veleta | -03 23 34 | 37 03 58 | 2870 | 30 | |
| | Robledo | -04 14 57 | 40 25 38 | 761 | | |
| | Yepes | -03 06 00 | 40 31 30 | 931 | | |
| Turkey | Gebse-Kocaeli | 29 26 52 | 40 47 06 | 200 | | |

*** ALL OF ANNEX 1 SHOULD BE CONSIDERED IN [ ]**

The Observatoire de Plateau de Bure interferometer consists of 3 antennas of 15 m diameter.

## REGION 2

| COUNTRY | SITE | LONG. o ' " | LAT. o ' " | ALT (m) | DIAM (m) | REMARKS |
|---|---|---|---|---|---|---|
| Chile | San Pedro de Atacama | 67 44 00 | -23 02 | 5000 | | MMA (planned)[2] |
| | La Silla | 70 44 04 | -29 15 34 | 2300 | 15 | SEST |
| | Las Campanas | 70 41 10 | -29 01 43 | 2440 | 4 | LMSA (planned)[3] |
| | Pampa La Bola | 67 42 00 | -22 58 00 | 4800 | | |
| Mexico | Sierra Negra | 97 18 00 | 18 59 00 | 4500 | 50 | Large Millimeter Telescope (LMT-under construction) |
| USA | Green Bank,WVA*** | 79 50 24 | 38 25 59 | 946 | 100 | NRAO-GBT |
| | Socorro, NM *** | 107 37 06 | 34 04 44 | 2155 | 25 | NRAO-VLA [4] |
| | ..... | ..... | ..... | ..... | ..... | ..... |
| | St. Croix, VI *** | 64 35 01 | 17 45 24 | 46 | 25 | NRAO VLBA[5] |
| | Hancock, NH *** | 71 59 12 | 42 56 01 | 340 | 25 | NRAO VLBA |
| | North Liberty, IO*** | 91 34 27 | 41 46 17 | 272 | 25 | NRAO VLBA |
| | Ft. Davis, TX *** | | 30 38 06 | 1646 | 25 | NRAO VLBA |
| | Los Alamos, NM *** | 103 56 41<br>106 14 44 | 35 46 31 | 1997 | 25 | NRAO VLBA |
| | Pie Town, NM *** | 108 07 09 | 34 18 04 | 2402 | 25 | NRAO VLBA |
| | Kitt Peak, AZ *** | | 31 57 23 | 1946 | 25 | NRAO VLBA |
| | Owens Valley, CA*** | 111 36 45<br>118 16 37 | 37 13 54 | 1237 | 25 | NRAO VLBA |
| | Brewster, WA *** | 119 41 00 | 48 07 52 | 286 | 25 | NRAO VLBA |
| | Mauna Kea, HI *** | 155 27 19 | 19 48 05 | 3751 | 25 | NRAO VLBA |
| | ..... | ..... | ..... | ..... | ..... | ..... |
| | Kitt Peak, AZ | 111 36 50 | 31 57 10 | 1930 | 12 | NRAO 12 m |
| | Amherst, MA | 72 20 40 | 42 23 33 | 314 | 13.7 | FCRAO (Five Colleges Obs.) |
| | Owens Valley, CA | 118 17 36 | 37 13 54 | 1236 | 10.4 | Caltech[6] |
| | Hat Creek, CA | 121 28 24 | 40 49 04 | 1042 | 6.1 | BIMA[7] |
| | Westford, MA | 71 29 19 | 42 37 23 | 122 | 36 | Haystack Obs. |
| | Mauna Kea, HI | 155 28 20 | 19 49 33 | 4000 | 10.4 | J.C. Maxwell Tel. |
| | Mauna Kea, HI | | | | | CSO |

[2] The USA MMA (MilliMeter Array) will consist of 40 antennas of 8-m diameter, on a ring configuration. The diameter of the ring will be capable of variation, ranging from 80 m to 10 km across.

[3] The Japanese LMSA (Large Southern Millimeter Array) will consist of 50 antennas of 10-m diameter.

[4] The VLA consists of 27 antennas of 25-m diameter, arranged in a Y pattern up to 36 km across.

[5] The VLBA consists of 10 antennas of 25 m diameter, distributed across the continental US, Hawaii and the US Virgin Islands

[6] The Caltech Interferometer consists of 3 antennas of 10.4 m diameter

[7] The BIMA (Berkeley-Illinois-Maryland Array) currently consists of 9 antennas of 6.1-m diameter. The final configuration will consist of 11 antennas.

## REGION 3

| COUNTRY | SITE | LONG. o ' " | LAT. o ' " | ALT. m | DIAM m | REMARKS |
|---|---|---|---|---|---|---|
| AUSTRALIA | Parkes | 148 15 44 | -33 00 00 | 60 | 64 | |
| | Mopra | 149 05 58 | -31 16 04 | | | |
| | Narrabri, NSW | 149 32 56 | -30 59 52 | | | Austr. Tel. Compact Array |
| CHINA | Delingha | 97 43 75 | 37 22 43 | 3200 | 13.7 | |
| JAPAN | Nobeyama[8] | 138 28 32 | 35 56 29 | 1350 | 45 | |
| | Kashima | 140 39 46 | 35 57 15 | 50 | 34 | Comm. Res. Lab. |
| | Mizusawa | 141 08 09 | 39 08 00 | 87 | 10 | |
| | Nagoya | 136 58 24 | 35 08 55 | 70 | 4 | |
| | Mt. Fuji | 138 45 06 | 35 21 30 | 3776 | 1.2 | Only >300GHz |
| | Kagoshima | 130 26 32 | 31 44 52 | 520 | 20 | VERA (planned) |
| KOREA | Taejon | 127 22 18 | 36 23 54 | 120 | 13.7 | |

## OTHER

| COUNTRY | SITE | LONG. o ' " | LAT. o ' " | ALT. m | DIAM m | REMARKS |
|---|---|---|---|---|---|---|
| | ANTARCTICA | | -90 00 00 | | | |

[7] The Nobeyama site includes a 45 m diameter telescope, an interferometer that consists of 6 antennas of 10 m diameter, and a 60 cm diameter submillimeter telescoope.

# *Radio Conference Subcommittee (RCS)*

*Preparation for ITU Radiocommunication Conferences*

## Analysis of Passive Services 71 – 275 Proposal[9]

- The fixed service (FS) had 106.4 GHz of allocations and the proposal gives them 127.6 GHz although some 12 GHz of this may have to be deleted if microwave limb sounders cannot share with terrestrial services. Furthermore, some 26.2 GHz of the total allocation are limited by footnote S5.553, although this is not likely a problem since the same limitation had previously existed for the mobile service in the same bands.

- The mobile service (MS) had 142.4 GHz of allocations and the proposal gives them 127.6 GHz although some 12 GHz of this may have to be deleted if microwave limb sounders cannot share with terrestrial services. The cause of the remaining deficit is simply that there were no more places that mobile allocations could be made. Note that in all cases the mobile service and the fixed service are co-allocated whereas previously this was not always the case.

- For the fixed-satellite service (FSS) analysis, see next page.

- The mobile-satellite service (MSS) had 3 GHz of uplinks and 3 GHz of downlinks with 36 GHz undesignated. The proposal gives MSS 21 GHz of uplinks and 8.5 GHz of downlinks with 16.2 GHz undesignated. Although the imbalance could be viewed as a problem, the overall total bandwidth is actually a little larger than before and much of the undesignated allocations could be designated as downlinks to yield an adequate balance for future applications.

- The inter-satellite service (ISS) currently is allocated some 35 GHz of bandwidth. In the proposal, the allocation is for 27.75 GHz of ISS of any type and an additional 18.45 GHz of ISS allocations limited to inter-satellite links between GSO satellites only. The total bandwidth available for ISS is therefore actually increased to 46.2 GHz, although about 40% of that is limited in use and another 34% is shared with FSS and MSS downlinks.

- Both the amateur and amateur-satellite services (AS & ASS) have 4.5 GHz of primary allocations both currently and in the proposal, although the allocations have been relocated from their original positions in some cases.

- The radiolocation service (RS) currently has 28 GHz allocated and in the proposal has 34 GHz allocated, partially due to the requested (consequential?) upgrade from 95 – 100 GHz. Sharing in the 95 – 100 GHz band may be problematic as there is also a primary MSS Earth-to-space allocation in the band.

- The broadcast service (BS) had 2 GHz allocated which has been reduced in the proposal to 1.5 GHz. The broadcast-satellite service (BSS) currently has 2 GHz allocated and that allocation was simply shifted down in frequency somewhat (was centered at 85 GHz and is centered at 72 GHz in proposal.

- The Earth exploration-satellite service (passive) (EESS (passive)) had 62 GHz of primary allocations from 71 – 275 GHz and in the proposal has 63.8 GHz although much give and take has occurred. One 3 GHz band allocated to EESS (passive) will be released in 2018. Space research (passive) (SR

[9] This data is provided as support material for the proposal contained in RCS 00-141p.

(passive)) has duplicated these changes in allocations for the use of passive sensors. However, SR (passive) limited in use to space-based radio astronomy has gotten an additional 16.2 GHz of allocations co-primary with radio astronomy allocations.

- The Earth exploration-satellite service (active) (EESS (active)) and space research (active) (SR (active)) has the exact same primary allocation for cloud radar from 94 – 94.1 GHz in the proposal as in the current allocation tables.

- The radio astronomy service (RAS) has increased its primary allocations from 48 GHz in the current tables to 135.15 GHz, although virtually all of these additional allocations are limited by footnote **S5.ZZZ**.

- The radionavigation service (RNS) and radionavigation-satellite service (RNSS) both have 36 GHz allocated currently and are proposed to have 34.2 GHz allocated due to the 1.8 GHz decrease from 190 – 200 GHz to 191.8 – 200 GHz to enable the 183.3 ± 8.5 GHz allocation for passive sensors.

- FSS allocations from 71 – 275 GHz (current):

| Band (GHz) | Bandwidth (GHz) | Downlink | Uplink |
|---|---|---|---|
| 71 – 75.5 | 4.5 | | X |
| 81 – 84 | 3 | X | |
| | | | |
| 92 – 95 | 2.9 | | X |
| 102 – 105 | 3 | X | |
| | | | |
| 149 – 164 | 15 | X | |
| 202 – 217 | 15 | | X |
| | | | |
| 231 – 241 | 10 | X | |
| 265 – 275 | 10 | | X |
| | | | |
| Totals | - | 31 | 32.4 |

FSS allocations 71 – 275 GHz (proposed):

| Band (GHz) | Bandwidth (GHz) | Downlink | Uplink |
|---|---|---|---|
| 71 - 76 | 5 | X | |
| 81.5 - 86 | 4.5 | | X |
| | | | |
| 126 - 134 | 8 | X | |
| 209 - 217 | 8 | | X |
| | | | |
| 158.5 - 164 | 5.5 | X | |
| 167 – 174.8 | 7.8 | X | |
| 231.5 - 235 | 3.5 | X | |
| 238 - 241 | 3 | X | |
| | | | |
| 217 – 226 | 9 | | X |
| 265 - 275 | 10 | | X |
| | | | |
| Totals | - | 32.8 | 31.5 |

- As can be seen from the tables, the total uplink and downlink FSS spectrum allocated in the proposal is actually slightly greater than is currently allocated. However, there are only three distinct uplink bands from 81.5 – 85 GHz, 209 – 226 GHz, and 265 – 275 GHz, while there are six distinct (non-contiguous) downlink bands from 71 – 76 GHz, 126 – 134 GHz, 158.5 – 164 GHz, 167 – 174.8 GHz, 231.5 – 235 GHz, and 238 – 241 GHz. Furthermore, the two largest of these downlink bands must be shared with an ISS allocation.

- Current Allocations from 71 – 275 GHz

| Band | FS | FSS | FSS | MS | MSS | MSS | MSS | ISS | AS | ASS | RS | BS | BSS | EESS | EESS | SRS | SRS | RAS | RNS | RNSS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (GHz) | | (s-E) | (E-s) | | (s-E) | (E-s) | (?) | | | | | | (s-E) | (p) | (a) | (p) | (a) | | | |
| 71-74 | 3 | | 3 | 3 | 3 | | | | | | | | | | | | | | | |
| 74-75.5 | 1.5 | | 1.5 | 1.5 | | | | | | | | | | | | | | | | |
| 75.5-76 | | | | | | | | | 0.5 | 0.5 | | | | | | | | | | |
| 76-81 | | | | | | | | | | | 5 | | | | | | | | | |
| 81-84 | 3 | 3 | | 3 | | 3 | | | | | | | | | | | | | | |
| 84-86 | 2 | | | 2 | | | | | | | | 2 | 2 | | | | | | | |
| 86-92 | | | | | | | | | | | | | | 6 | | 6 | | 6 | | |
| 92-94 | 2 | | 2 | 2 | | | | | | | 2 | | | | | | | | | |
| 94-94.1 | | | | | | | | | | | 0.1 | | | | 0.1 | | 0.1 | | | |
| 94.1-95 | 0.9 | | 0.9 | 0.9 | | | | | | | 0.9 | | | | | | | | | |
| 95-100 | | | | 5 | | | 5 | | | | | | | | | | | | 5 | 5 |
| 100-102 | 2 | | | 2 | | | | | | | | | | 2 | | 2 | | | | |
| 102-105 | 3 | 3 | | 3 | | | | | | | | | | | | | | | | |
| 105-116 | | | | | | | | | | | | | | 11 | | 11 | | 11 | | |
| 116-119.98 | 3.98 | | | 3.98 | | | | 3.98 | | | | | | 3.98 | | 3.98 | | | | |
| 119.98-120.02 | 0.04 | | | 0.04 | | | | 0.04 | | | | | | 0.04 | | 0.04 | | | | |
| 120.02-126 | 5.98 | | | 5.98 | | | | 5.98 | | | | | | 5.98 | | 5.98 | | | | |
| 126-134 | 8 | | | 8 | | | | 8 | | | 8 | | | | | | | | | |
| 134-142 | | | | 8 | | | 8 | | | | | | | | | | | | 8 | 8 |
| 142-144 | | | | | | | | | 2 | 2 | | | | | | | | | | |
| 144-149 | | | | | | | | | | | 5 | | | | | | | | | |
| 149-150 | 1 | | 1 | 1 | | | | | | | | | | | | | | | | |
| 150-151 | 1 | | 1 | 1 | | | | | | | | | | 1 | | 1 | | | | |
| 151-156 | 5 | | 5 | 5 | | | | | | | | | | | | | | | | |
| 156-158 | 2 | | 2 | 2 | | | | | | | | | | 2 | | | | | | |
| 158-164 | 6 | | 6 | 6 | | | | | | | | | | | | | | | | |
| 164-168 | | | | | | | | | | | | | | 4 | | 4 | | 4 | | |
| 168-170 | 2 | | | 2 | | | | | | | | | | | | | | | | |
| 170-174.5 | 4.5 | | | 4.5 | | | | 4.5 | | | | | | | | | | | | |
| 174.5-176.5 | 2 | | | 2 | | | | 2 | | | | | | 2 | | 2 | | | | |
| 176.5-182 | 5.5 | | | 5.5 | | | | 5.5 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 182-185 | | | | | | | | | | | | | | 3 | | 3 | | 3 | | |
| 185-190 | 5 | | | 5 | | | | 5 | | | | | | | | | | | | |
| 190-200 | | | | 10 | | | 10 | | | | | | | | | | | | 10 | 10 |
| 200-202 | 2 | | | 2 | | | | | | | | | | 2 | | 2 | | | | |
| 202-217 | 15 | 15 | | 15 | | | | | | | | | | | | | | | | |
| 217-231 | | | | | | | | | | | | | | 14 | | 14 | | 14 | | |
| 231-235 | 4 | | 4 | 4 | | | | | | | | | | | | | | | | |
| 235-238 | 3 | | 3 | 3 | | | | | | | | | | 3 | | 3 | | | | |
| 238-241 | 3 | | 3 | 3 | | | | | | | | | | | | | | | | |
| 241-248 | | | | | | | | | | | 7 | | | | | | | | | |
| 248-250 | | | | | | | | | 2 | 2 | | | | | | | | | | |
| 250-252 | | | | | | | | | | | | | | 2 | | 2 | | | | |
| 252-265 | | | | 13 | | | 13 | | | | | | | | | | | | 13 | 13 |
| 265-275 | 10 | 10 | | 10 | | | | | | | | | | | | | | 10 | | |
| **Totals** | **106.4** | **31** | **32.4** | **142.4** | **3** | **3** | **36** | **35** | **4.5** | **4.5** | **28** | **2** | **2** | **62** | **0.1** | **60** | **0.1** | **48** | **36** | **36** |
| | **FS** | **FSS** | **FSS** | **MS** | **MSS** | **MSS** | **MSS** | **ISS** | **AS** | **ASS** | **RS** | **BS** | **BSS** | **EESS** | **EESS** | **SRS** | **SRS** | **RAS** | **RNS** | **RNSS** |
| | | **(s-E)** | **(E-s)** | | **(s-E)** | **(E-s)** | **(?)** | | | | | | **(s-E)** | **(p)** | **(a)** | **(p)** | **(a)** | | | |

# Proposed Allocations from 71 – 275 GHz

| Band (GHz) | FS | FSS (s-E) | FSS (E-s) | MS | MSS (s-E) | MSS (E-s) | MSS (?) | ISS | ISS (GSO) | AS | ASS | RS | BS | BSS (s-E) | EESS (p) | EESS (a) | SRS (p) | SRS (RA) | SRS (a) | RAS | RNS | RNSS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 71-73 | 2 | 2 | | 2 | | | | | | | | | | 2 | | | | | | | | |
| 73-76 | 3 | 3 | | 3 | 3 | | | | | | | | | | | | | | | | | |
| 76-76.5 | | | | | | | | | | 0.5 | 0.5 | | | | | | | | | | | |
| 76.5-81.5 | | | | | | | | | | | | 5 | | | | | | | | 5 | | |
| 81.5-84.5 | 3 | | 3 | 3 | | 3 | | | | | | | | | | | | | | 3 | | |
| 84.5-86 | 1.5 | | 1.5 | 1.5 | | | | | | | | | 1.5 | | | | | | | 1.5 | | |
| 86-92 | | | | | | | | | | | | | | | 6 | | 6 | | | 6 | | |
| 92-94 | 2 | | | 2 | | | | | | | | 2 | | | | | | | | 2 | | |
| 94-94.1 | | | | | | | | | | | | 0.1 | | | | 0.1 | | | 0.1 | | | |
| 94.1-95 | 0.9 | | | 0.9 | | | | | | | | 0.9 | | | | | | | | 0.9 | | |
| 95-100 | 5 | | | 5 | | 5 | | | | | | 5 | | | | | | | | 5 | 5 | 5 |
| 100-102 | 2 | | | 2 | | | | | | | | | | | 2 | | 2 | | | 2 | | |
| 102-105 | 3 | | | 3 | | | | | | | | | | | | | | | | 3 | | |
| 105-109.5 | 4.5 | | | 4.5 | | | | | | | | | | | | | | 4.5 | | 4.5 | | |
| 109.5-111.8 | | | | | | | | | | | | | | | 2.3 | | 2.3 | | | 2.3 | | |
| 111.8-114.25 | 2.45 | | | 2.45 | | | | | | | | | | | | | | 2.45 | | 2.45 | | |
| 114.25-116 | | | | | | | | | | | | | | | 1.75 | | 1.75 | | | 1.75 | | |
| 116-119.98 | | | | | | | | | 3.98 | | | | | | 3.98 | | 3.98 | | | | | |
| 119.98-120.02 | | | | | | | | | 0.04 | | | | | | 0.04 | | 0.04 | | | | | |
| 120.02-122.25 | | | | | | | | | 2.23 | | | | | | 2.23 | | 2.23 | | | | | |
| 122.25-126 | 3.75 | | | 3.75 | | | | 3.75 | | | | | | | | | | | | 3.75 | | |
| 126-134 | | 8 | | | | | 8 | 8 | | | | | | | | | | | | | 8 | 8 |
| 134-136 | | | | | | | | | | 2 | 2 | | | | | | | | | | | |
| 136-141 | | | | | | | | | | | | 5 | | | | | | | | 5 | | |
| 141-148.5 | 7.5 | | | 7.5 | | | | | | | | 7.5 | | | | | | | | 7.5 | | |
| 148.5-151.5 | | | | | | | | | | | | | | | 3 | | 3 | | | 3 | | |
| 151.5-153 | 1.5 | | | 1.5 | | | | | | | | 1.5 | | | | | | | | 1.5 | | |
| 153-155.5 | 2.5 | | | 2.5 | | | | | | | | | | | | | | 2.5 | | 2.5 | | |
| 155.5-158.5 | 3 | | | 3 | | | | | | | | | | | 3 | | | 3 | | 3 | | |
| 158.5-164 | 5.5 | 5.5 | | 5.5 | 5.5 | | | | | | | | | | | | | | | | | |
| 164-167 | | | | | | | | | | | | | | | 3 | | 3 | | | 3 | | |
| 167-168 | 1 | 1 | | 1 | | | | 1 | | | | | | | | | | | | | | |
| 168-174.8 | 6.8 | 6.8 | | 6.8 | | | | 6.8 | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 174.8-176.5 | | | | | | | | | 1.7 | | | | | | 1.7 | | 1.7 | | | | | |
| 176.5-182 | | | | | | | | | 5.5 | | | | | | 5.5 | | 5.5 | | | | | |
| 182-185 | | | | | | | | | | | | | | | 3 | | 3 | | | | | |
| 185-190 | | | | | | | | | 5 | | | | | | 5 | | 5 | | | | | |
| 190-191.8 | | | | | | | | | | | | | | | 1.8 | | 1.8 | | | | | |
| 191.8-200 | 8.2 | | | 8.2 | | | 8.2 | 8.2 | | | | | | | | | | | | | 8.2 | 8.2 |
| 200-202 | 2 | | | 2 | | | | | | | | | | | 2 | | 2 | | | 2 | | |
| 202-209 | 7 | | | 7 | | | | | | | | | | | 7 | | 7 | | | 7 | | |
| 209-217 | 8 | | 8 | 8 | | | | | | | | | | | | | | | | 8 | | |
| 217-226 | 9 | | 9 | 9 | | | | | | | | | | | | | | | | 9 | | |
| 226-231.5 | | | | | | | | | | | | | | | 5.5 | | 5.5 | | | 5.5 | | |
| 231.5-235 | 3.5 | 3.5 | | 3.5 | | | | | | | | | | | | | | | | | | |
| 235-238 | 3 | | | 3 | | | | | | | | | | | 3 | | 3 | | | | | |
| 238-241 | 3 | 3 | | 3 | | | | | | | | | | | | | | | | | | |
| 241-248 | | | | | | | | | | | | 7 | | | | | | | | 7 | | |
| 248-250 | | | | | | | | | | 2 | 2 | | | | | | | | | 3 | | |
| 250-252 | | | | | | | | | | | | | | | 2 | | 2 | | | 2 | | |
| 252-265 | 13 | | | 13 | | 13 | | | | | | | | | | | | | | 13 | 13 | 13 |
| 265-275 | 10 | | 10 | 10 | | | | | | | | | | | | | | | | 10 | | |
| **Totals** | **127.6** | **32.8** | **31.5** | **127.6** | **8.5** | **21** | **16** | **27.75** | **18.45** | **4.5** | **4.5** | **34** | **1.5** | **2** | **63.8** | **0.1** | **60.8** | **12.5** | **0.1** | **135.15** | **34.2** | **34.2** |
| **- Before Tot** | **106.4** | **32.4** | **31** | **142.4** | **3** | **3** | **36** | **35** | **0** | **4.5** | **4.5** | **28** | **2** | **2** | **62** | **0.1** | **60** | **0** | **0.1** | **48** | **36** | **36** |
| **Difference** | **21.2** | **0.4** | **0.5** | **-14.8** | **5.5** | **18** | **-20** | **-7.25** | **18.45** | **0** | **0** | **6** | **-0.5** | **0** | **1.8** | **0** | **0.8** | **12.5** | **0** | **87.15** | **-1.8** | **-1.8** |
| | **FS** | **FSS** | **FSS** | **MS** | **MSS** | **MSS** | **MSS** | **ISS** | **ISS** | **AS** | **ASS** | **RS** | **BS** | **BSS** | **EESS** | **EESS** | **SRS** | **SRS** | **SRS** | **RAS** | **RNS** | **RNSS** |
| | | **(s-E)** | **(E-s)** | | **(s-E)** | **(E-s)** | **(?)** | | **(GSO)** | | | | | **(s-E)** | **(p)** | **(a)** | **(p)** | **(RA)** | **(a)** | | | |